Frederick County Cancer Investigation: Summary Report

Frederick County Health Department
Maryland Department of
Health and Mental Hygiene
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Purpose

- Using Maryland Cancer Registry data, look at cancer incidence in Frederick County, particularly at the area around Fort Detrick, in order to determine whether there is evidence of a clustering of cancer

Summary: Methods I

- Evaluate cancer incidence for cancers diagnosed from 2000 – 2007 in the three census tracts that comprise approximately a one-mile buffer around the perimeter of the Fort Detrick installation
- Expanded evaluation in the same three census tracts for cancers diagnosed from 1992 – 2008
- Evaluate cancer incidence for cancers diagnosed from 1992 – 2008 in the 10 census tracts that comprise approximately a two-mile buffer around the perimeter of the Fort Detrick installation

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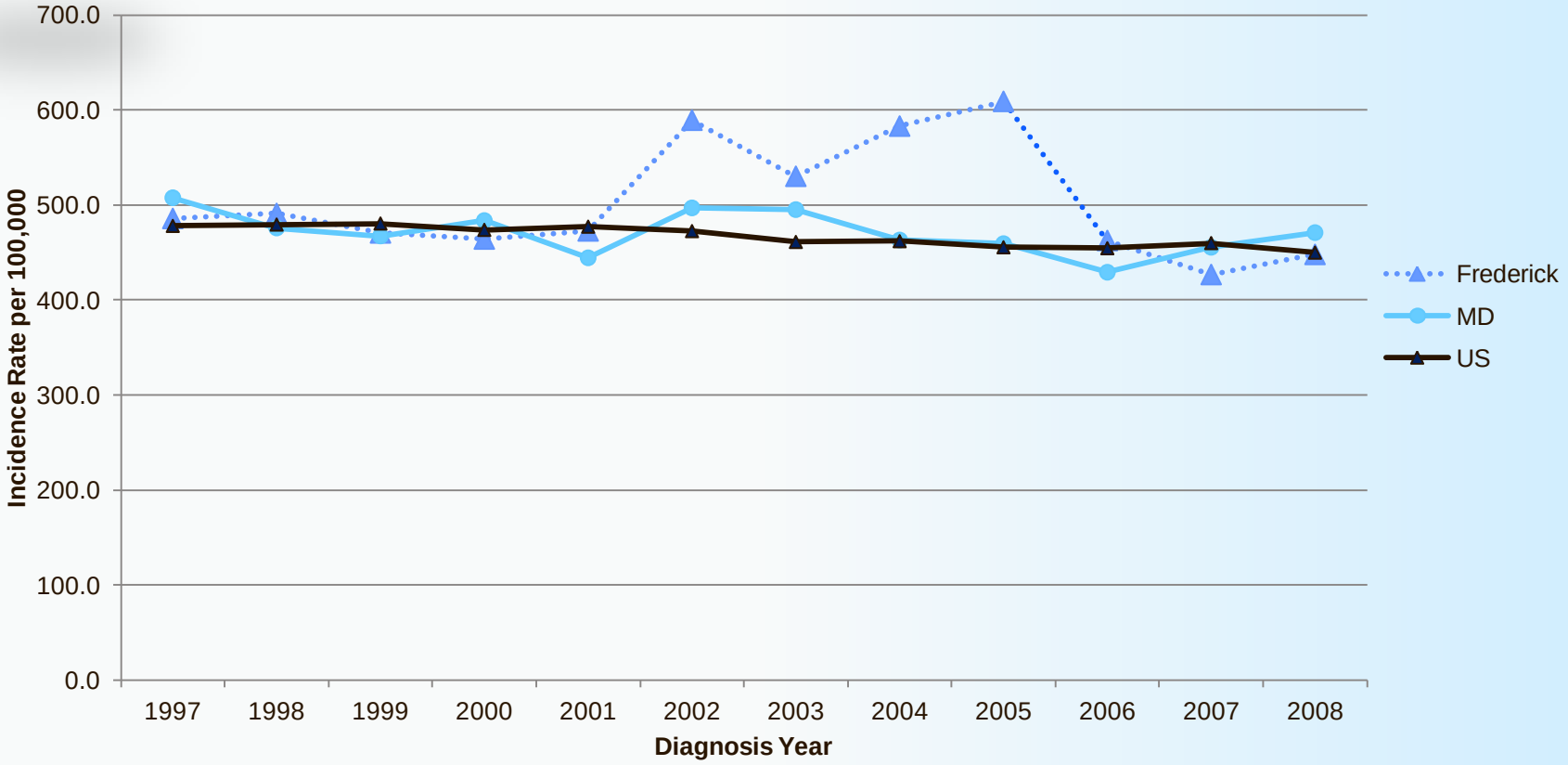
Methods II

- Conduct a statistical analysis of how and whether cancers were clustered by geography, time, and type of cancer for all of Frederick County for the period 1992 – 2008; and,
- Analyze the age of diagnosis for different cancers in the areas closest to Fort Detrick, compared with the age of diagnosis for the same cancers in Frederick County and Maryland.

Incidence Rates for All Cancers 1997--2007: Frederick County, Maryland, and U.S.*



Incidence rates age adjusted and standardized to the 2000 U.S. Standard Population
Source: Maryland Cancer Registry, September, 2011

Analysis of Cancer Incidence by Standardized Incidence Ratios

1 – Mile Buffer

2-Mile Buffer

Cases Observed in the 3 Census Tracts and Expected Numbers of Cases for Specific Cancer Sites, 2000-2007 (Census Tracts 750501, 750700, 751200)

Cancer Type*	Observed Number of Cases in CT 750501, 750700, 751200	^ Expected Number of Cases based on Frederick County rates 2000-2007	SIR** compared to Frederick County	95% CI	CT 750501, 750700, 751200 Statistically different from Frederick County	Expected Number of Cases based on Maryland 2000-2007	SIR** compared to Maryland	95% CI	CT 750501, 750700, 751200 Statistically different from Maryland
All sites	1059	1072	0.99	0.93-1.05	**No**	957	1.11	1.04-1.17	**Yes**
Lung & Bronchus	149	141	1.06	0.89-1.24	**No**	133	1.12	0.94-1.31	**No**
Female Breast	159	161	0.99	0.84-1.15	**No**	148	1.07	0.91-1.25	**No**
Colorectal Cancer	102	114	0.89	0.73-1.08	**No**	99	1.03	0.83-1.24	**No**
Prostate	141	146	0.96	0.81-1.14	**No**	136	1.04	0.87-1.22	**No**
Brain & CNS	11	17	0.66	0.32-1.15	**No**	14	0.80	0.39-1.41	**No**
Kidney & Bladder	79	76	1.04	0.82-1.29	**No**	65	1.21	0.95-1.50	**No**
Leukemia & Lymphoma	79	71	1.11	0.88-1.38	**No**	63	1.26	1.00-1.57	**No**
Thyroid	29	32	0.90	0.60-1.29	**No**	24	1.18	0.78-1.69	**No**

* Includes all invasive cancer excluding basal and squamous cell carcinoma of the non-genital skin, and including in situ bladder cancer
** Standard Incidence Ratio = Observed Cases/ Expected Cases
^ Observed and Expected cases derived from Maryland Cancer Registry consolidated data as of 12/1/2009

Cases Observed in the 3 Census Tracts and Expected Numbers of Cases for Specific Cancer Sites, 1992-2008 (Census Tracts 750501, 750700, 751200)

Cancer Type	Observed Number in CTs 750501 ,750700, 751200	Expected cases based on Frederick County 1992-2008	SIR** compared to Frederick County	95% CI	CTs 750501, 750700, 751200 Statistically different from Frederick County	Expected cases based on Maryland 1992-2008	SIR** compared to Maryland	95% CI	CTs 750501, 750700, 751200 Statistically different from Maryland
	n	n^				n^			
All sites	1906	1931	0.99	0.94-1.03	No	1896	1.00	0.96-1.05	No
Lung & Bronchus	269	257	1.05	0.92-1.18	No	271	0.99	0.88-1.12	No
Female Breast	315	299	1.05	0.94-1.18	No	296	1.06	0.95-1.19	No
Prostate	255	261	0.98	0.86-1.10	No	278	0.92	0.80-1.04	No
Brain & CNS	25	31	0.80	0.51-1.17	No	27	0.92	0.59-1.34	No
Kidney & Bladder	136	139	0.98	0.82-1.15	No	127	1.07	0.89-1.27	No
Leukemia	37	42	0.89	0.62-1.22	No	40	0.93	0.65-1.28	No
Lymphoma	102	91	1.12	0.91-1.36	No	82	1.25	1.01-1.50	Yes
Liver	17	13	1.31	0.75-2.08	No	19	0.88	0.50-1.39	No
Thyroid	44	50	0.89	0.64-1.18	No	39	1.13	0.82-1.51	No

SeerStat data as of 02/08/2011 was used to calculate expected number of cases using Frederick County and Maryland.
CT* Census Tract. SIR** Standard Incidence Ratio= Observed Cases/Expected Cases. ^ expected number of cases=(1992-2008 Frederick or Maryland State cancer rates) X (population of 3 CTs*).
Observed and Expected cases derived from Maryland Cancer Registry consolidated data as of February 8, 2011 with county and Maryland age-specific rates calculated in SEER Stat and used to determine expected numbers the 3 census tracts.

Cases Observed in the 10 Census Tracts and Expected Numbers of Cases for Specific Cancer Sites, 1992-2008 (Census Tracts 750100,750200,750300,750400,750501,750502,750600,750700, 750800, 751200)

Cancer Site*	^Observed Number in 10 Census Tracts	^Expected Number of Cases Based on Age-Specific Frederick County Rates 1992-2008	SIR** compared to Frederick County	95% CI	10 Census Tracts Statistically Different from Frederick County?	^Expected Number of Cases Based on Age-Specific Maryland Rates 1992-2008	SIR** compared to Maryland	95% CI	10 Census Tracts Statistically Different from Maryland?
	n	n^				n^			
All sites	4,379	4,592	0.95	0.93-0.98	Yes--Lower	4,498	0.97	0.94-1.00	No
Lung & Bronchus	605	620	0.98	0.89-1.06	No	651	0.93	0.86-1.00	No
Female Breast	682	698	0.98	0.90-1.05	No	689	0.99	0.92-1.07	No
Colorectal Cancer	480	517	0.93	0.85-1.02	No	495	0.97	0.88-1.06	No
Prostate	599	634	0.95	0.87-1.23	No	667	0.89	0.83-0.97	No
Brain & CNS	65	72	0.90	0.69-1.15	No	62	1.04	0.80-1.32	No
Kidney & Bladder***	316	334	0.95	0.84-1.06	No	304	1.04	0.93-1.16	No
Leukemia	82	99	0.83	0.66-1.03	No	94	0.87	0.69-1.08	No
Lymphoma	207	213	0.97	0.84-1.11	No	192	1.08	0.94-1.24	No
Liver	34	31	1.10	0.76-1.54	No	46	0.74	0.50-1.03	No
Thyroid	97	111	0.88	0.70-1.07	No	87	1.12	0.90-1.36	No

* Includes all invasive cancer excluding basal and squamous cell carcinoma of the non-genital skin, and including in situ bladder cancer
** Standard Incidence Ratio= Observed Cases/Expected Cases
***Includes in situ bladder cancer
^ expected number of cases=(1992-2008 Frederick or Maryland State cancer rates) X (population of 10 CTs*). Observed and Expected cases derived from Maryland Cancer Registry consolidated data as of February 8, 2011 with county and Maryland age-specific rates calculated in SEER Stat and used to determine expected numbers the 10 census tracts.

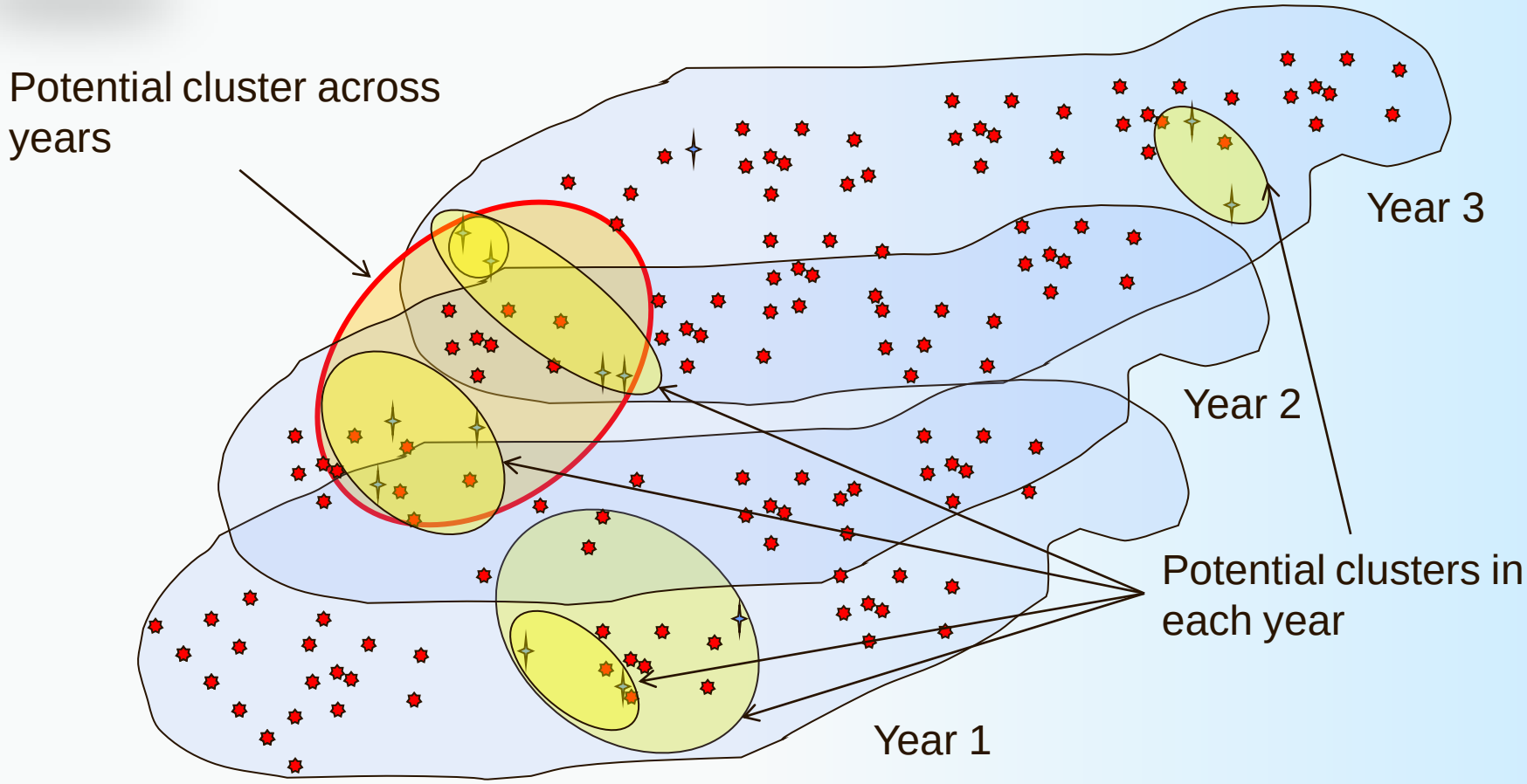
Analysis of Clustering in Frederick County Using SaTScan Program

Diagnostic Groups Used for SaTScan Cluster Analysis, Based on Cancer Diagnoses in Maryland Cancer Registry, 1992-2008

Cancer Diagnostic Group	MCR "Cancertypes" Included in Group	Number of Cases	Total Cases in Cluster Analysis
Breast	Female, Male Breast		2,243
Bone	Bone and Joint	38	38
Dermatologic			747
	Other skin	47	
	Skin melanoma	700	
Endocrine			411
	Other endocrine	26	
	Thyroid	385	
Gastrointestinal	17 cancer types		2,875
Genitourinary	7 cancer types		1,247
Gynecologic	5 cancer types		901
Hematologic			1,166
	Acute lymphocytic leukemia	37	
	Acute myelocytic leukemia	90	
	Chronic lymphocytic leukemia	96	
	Chronic myelocytic leukemia	35	
	Hodgkin's lymphoma	118	
	Multiple myeloma	177	
	Non-Hodgkin's lymphoma	568	
	Other leukemia	45	
Liver	Liver	80	80
Neurologic			231
	Brain	218	
	Other nerve	13	
Prostate	Prostate	2,133	2,133
Pulmonary			1,972
	Lung and bronchus	1,897	
	Mesothelioma	20	
	Nasopharynx or Other respiratory	55	
Diagnoses Included in the Analysis by Major Diagnostic Group			14,044
Diagnoses Not Assigned to a Group but Included in Denominator			592
Total Diagnoses Used for Denominator			14,636

Clusters Over Space and Time: Theoretical Model

= Case of a specific cancer type
= All cancer cases



Note: Data is for illustration only and does not represent any real example.

Results of SaTScan Cluster Analysis of Cancers Diagnosed with an Address in Frederick County, 1992-2008 (N=14,636)

Cancer Diagnostic Group	Cluster Size (radius in kilometers)	Probability Value (p-value)	Statistically Significant
Breast	5.5	1.0	No
Bone	1.8	0.93	No
Dermatologic	6.3	0.86	No
Endocrine	3.4	0.098	No
Gastrointestinal	6.9	1.0	No
Genitourinary	8.0	1.0	No
Gynecologic	11.7	0.91	No
Hematologic	7.2	0.57	No
Liver	3.2	0.89	No
Neurologic	0	0.129	No
Prostate	22.1	0.94	No
Pulmonary	3.6	0.93	No

*Based on a discrete Poisson probability model using SaTScan version 9.1.1.

Comparison of Age of Diagnosis for Cancers by Type of Cancer

Age at Diagnosis for all In Situ and Invasive Cancer for All Cancer Diagnoses, 1992 - 2008*

Mean Age at Diagnosis in Years (standard deviation)			
Cancer Group	Frederick, 10 Census Tracts	Frederick County	Significant Difference?
Bone	42.6 (25.9)	40.6 (22.9)	No
Breast	61.6 (15.4)	60.6 (14.9)	No
Endocrine	44.8 (15.1)	47.2 (15.4)	No
Gastrointestinal	68.3 (13.8)	67.8 (22.2)	No
Genito urinary	65.2 (17.7)	63.4 (17.2)	No
Gynecologic	60.5 (16.2)	59.9 (15.2)	No
Hematologic	59.9 (20.0)	59.6 (20.1)	No
Liver	61.8 (17.9)	62.8 (16.0)	No
Lung	69.3 (11.6)	68.5 (11.5)	No
Neurologic	55.7 (20.7)	52.0 (22.9)	No
Prostate	68.4 (10.5)	69.0 (30.3)	No
Skin--Melanoma	57.1 (17.9)	57.1 (38.6)	No

*Includes all invasive and in situ cancer.
Source: Maryland Cancer Registry, Consolidated Data 02082011

Evaluation of Reports of Cancers Provided by Frederick Citizens

Evaluation of the Citizen List and Match to the Maryland Cancer Registry

Number of people with one or more conditions reported including conditions other than cancer	435
Number of people reporting one or more cancers	398
Number of tumors reported	476
Number of reportable tumors reported	452
Probable matches found in the MCR	183
Not found in the MCR	269
Reasons why potentially not found:	
No Name or insufficient identifying info	42
Diagnosed before 1992	68
Diagnosed in 2008—2010, too recent to be in MCR	46
No diagnosis date	27
Could be a metastatic site from another tumor that was found *	16
Possibly not reportable	2
No reason identified	68
Number of reportable tumors NOT reported by citizens but a probable match was found in MCR by the patient's name	21

Conclusions and Next Steps

Conclusions - 1

- Compared with Frederick County, there were no statistically significant increases in all cancers or in specific types of cancer in the three census tracts that constitute an area of 1-mile radius around Fort Detrick for the period 1992 – 2008
- Compared with Maryland as a whole, lymphoma was slightly increased for the same time period (1992-2008). There were no other increases in any other cancers or in all cancers compared with the State as a whole.

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Conclusions - 2

- When an additional seven census tracts were added to the original three, expanding the buffered area around Fort Detrick to approximately a 2-mile radius, there were no significant increases in either all cancers or in specific types of cancer around Ft. Detrick for the period 1992—2008, compared with Frederick County or the State as a whole

Conclusions - 3

- According to an earlier analysis, the age-adjusted rate of all cancers in Frederick County had increased between 2001 and 2006, compared with both Maryland and the United States. This increase is unlikely to be related to environmental exposures in the Fort Detrick area. If cancer occurrences were affected by environmental exposures from decades ago, the effect would be less likely to show up in a narrow range of time than to be spread out over many years. Analysis of the cancer rates for the three census tracts closest to Fort Detrick for the period 2000-2007 did not show significant increases in the cancers of greatest concern, compared with either Frederick County or the State.

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Conclusions - 4

- Analysis of potential space-time “clustering” using the SaTScan program showed no significant clusters, when comparing specific cancer diagnosis groups with all cancer in the ten census tracts and Frederick County for the period 1992 – 2008

Conclusions - 5

- No significant difference in the ages at diagnosis for cancers in specific diagnostic groups in people living close to Fort Detrick (within the 10 census tracts immediately surrounding the installation) compared with people in Frederick as a whole

Conclusions - 6

- Citizen reports of cancers
  - Some correspondence between those on the citizen list and those registered with the Maryland Cancer Registry
  - Too many differences to use the reports directly as case finding sources

Next Steps - 1

- FCHD, DHMH – MCR will continue to review cancer incidence in Frederick County as a whole as new data become available
  - Look in more detail at which cancers contributed to the observed increase and potential explanations for overall increase then decrease from 2001 – 2007

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Next Steps - 2

- DHMH and FCHD will specifically look in more detail at lymphoma rates for the areas in question and for Frederick County as a whole, including different types of lymphoma, and ages of onset of different types of lymphoma

Next Steps - 3

- If new information about environmental exposures, environmental risks, or other factors becomes available, DHMH and FCHD will review that new information in light of this and future evaluations of cancer in Frederick County

Next Steps - 4

- FCHD and DHMH will report back to the community on the above efforts, and use those opportunities for public education and information around issues of cancer, cancer prevention, and cancer detection

Questions?